RS-INT
REGENERATION
Planting
Fp-7

October 26, 1939

NOTES ON REEXAMINATION OF 1939 TOOL-TEST PLANTING PLOTS (SERIES NO. 80 to 85)

General: All plots in the 1939 tool-test series (plots No. 80 to 85) were examined first in June (21 - 28) and a second time in October (17 to 24). In the first check essentially only the condition of the seedlings was noted; it being in the main a rapid and cursory inspection; in the autumn check, the condition of, and causes of injury to, each seedling was noted, and also the total height (from the general ground line to the tip of the terminal bud where terminal bud was alive, otherwise to end of live portion of stem) was recorded in inches and tenths. The early summer check was intended to record that portion of gross mortality attributable largely to such causes as injured stock, faulty planting, etc. The autumn check is believed to reflect also the importance of the primary factors such as drought, heat, and grazing.

From a practical standpoint the plantings failed completely. Flat plots had an average survival of 28.4 percent, while northerly slope plots showed a survival percentage of 12.7 percent at the end of the first growing season. Even from an experimental standpoint, the survival is so low as to cast some doubt on the value and validity of carrying out the original plan of analysis because of the preponderance of zeros or low number among the observations. Some tools and some sources are notably better than others; the Wind River F2-1 stock deserves special plaudits. The S3-0 Bannock Creek nursery stock was definitely the poorest. It happened to be the only seedbed stock to be tried out, the rest being various classes of transplants; its poor

balance between top and root was doubtless a very important contributing cause for its failure. The methods employing digging technique triumphed over those using bar technique, again indicating that disturbance of soil at least on brushy sites tends to be beneficial.

The following symbols were used to indicate cause of death and/or injury:

RB -- Seedlings buried by rodents in the course of their diggings, causing smothering by complete burial of top.

RD -- Seedling dug out partly or entirely; roots cut or exposed.

RC -- Seedling eaten partly by rodent; usually a more severe case than of bud nipping which is indicated by BN.

CT -- Trampled by cattle; stem and top bent, bruised or broken.

ST -- Trampled by sheep; stem and/or tip bent, bruised or broken. In some cases where injury is severe, the notation TB appears above CT or ST meaning that the stem of the seedling at some point has been broken by trampling by the factor indicated.

CB -- Needles and/or bud browsed by cattle.

SB -- Needles and/or bud browsed by sheep.

EB -- Seedling covered entirely or only partly buried by eroding soil; does not distinguish between sloughed soil induced by cattle and sheep trampling and soil movement caused by physiographic agencies.

EC -- Roots exposed by cutting action of rain water, etc.

CSS --Seedling crushed or bent by falling snags of sapling or pole size.

CSL --Seedling crushed or bent by large snags (above pole size)

CFL --Seedling bent or crushed by falling limbs.

CFB --Seedling bent, crushed, or covered by falling bark from nearby snags.

PS -- Seedling planted too shallow; part of roots left exposed.

PL -- Seedling planted deep enough but not tamped sufficiently; hole not filled properly, allowing roots to dry.

PD -- Seedling planted too deep covering part of the needles or permitting normal soil movement to easily bury the tops.

BN -- Bud nipped; not a cause of injury but a type of injury; used usually when the cause was not known, i.e., may have been cattle, sheep or rodents.

TB -- Another symbol of type of injury; designates broken top usually caused by trampling, or other mechanical means.

TD -- Top dead; when followed by I or "Ins." indicates that insects killed top. A common form of injury on some plots but not on the tool-test series.

WT -- Seedlings crushed, broken, or otherwise injured by woodcutters tractor. This type of injury possibly confined to plot No. 81.

U -- Unknown; usually indicates drought or heat kill; principally drought. Was used in all cases where no other primary causes were apparent. Should be by far the most common symbol in the cause column. In some instances U is used in connection with other cause symbols, indicating that while other injury was present, the seedling died most likely from the effects of drought.

Other symbols may have been invented and would ordinarily appear of the field data sheets at the bottom of the first sheet on which symbol was first used.

In attempting to assign causes for seedling deaths there may have been a tendency to give undue weight to such factors as cattle trampling, sheep trampling or browsing, deep planting, etc. These were doubtless contributing causes in most cases, but it is a debatable point as to how many times they were the actual cause of death. It is well to have this information on record, because it gives a picture of the proportion of injury by various factors, but care should be exercised in the interpretations on causes of death. It is known that in good years like 1938 various causes exclusive of heat and drought tend to become secondary; in other words the seedling can stand considerable abuse, if heat and drought conditions are not severe. On the other hand in such unfavorable years like 1939, irrespective of the occurrence of "other" injuries, the seedlings would have very likely died anyway from heat or drought.

This then is the primary cause of failure of plantings, regardless of how many other causes have been recorded.

Grazing had occurred on all plots; sheep grazing was reported on the Mores Creek plots already on the June 21-28 checks and cattle were found then and throughout the summer on the Pine Creek plot. Grazing had actually been most intense on the flat plots on Mores Creek, but probably as much or more damage had been done on the northerly slopes because of the steeper terrain and loose soils. Thelast band of sheep on Mores Creek had evidently been through the plots shortly before the early October rain.

The general survival to date is summarized in Table 1. Notes on individual plots are as follows:

Plot No. 80: This plot was checked on October 18, 1939.

Grazing by sheep was quite heavy and of a relatively recent date. Because the location was on a flat, little or no damage seemed attributable to sheep (sheep damage seemed to be more serious on slopes where slipping of hoofs resulted in soil movement causing the burying of seedlings, or their being trampled out of the ground). In many instances falling limbs and bark were responsible for crushing or burying of seedlings, notably in rows M-C, S-C, I-G, M-G, B-G, I-R, and B-M.

In some cases planting seemed to have been too shallow and too loose but such practice was not conclusively the cause of death. For instance, in reference to Wind River Stock, it managed to do quite well in spite of any method or care in planting.

The average survival of the plot was 40.6 percent. Wind River with an average survival of 76 percent was the best stock with Savenac second at 46.8 percent. All others were below 30 percent in survival.

The shallow shovel planting was best with 51.2 percent survival followed by deep shovel at 48 percent and Mattock and Council D handle at 44 percent. The slit shovel and two bar techniques showed an average of about 27 percent.

Plot No. 81: This plot was checked on October 17, 1939 except for the last 4 rows (rows 31 - 35) which were examined on October 18. The plot had been heavily grazed by sheep, evidently throughout the summer. Numerous well-worn trails and paths criss-crossed the entire area. In addition to sheep, wood-cutters had been skidding logs with a cat across the plot leaving some definite grooves in the ground and causing general disturbance on the surface. Actually damage was surprisingly slight, however, and confined pretty well to the west corner of the plot.

Many seedlings were not found despite a fairly diligent search; these were evidently the cases where the seedlings had died early or had dried sufficiently to break into smithereens when kicked or trampled by sheep. It appeared that in some instances only 24 seedlings had been originally planted. Notations are made on the data sheets in such cases. Despite the heavy trampling, drought and heat were definitely the major causes of mortality, so far as could be determined at this stage from the appearance of the seedlings. Planting appeared to be of pretty fair quality throughout the plot i.e., there wasn't any notable number planted loosely, too deep or too shallow. All tools seemed to have performed satisfactorily; even the R-1 tool job appeared surficially acceptable.

As regards survival, the average for the plot was 22.4 percent, including all living vigorous, all living, and all living but doubtful seedlings. (Strictly speaking, all living but doubtful seedlings should be excluded from the survival tally, since they generally pass out of

the picture before the second growing season ends.) Wind River stock with an average survival of 50.8 percent was the stand-out stock of the season. All others on this plot survived less than 20 percent. Deep shovel planting with a survival of 35.2 percent was the best of the tools, followed by shallow shovel with 31.2 percent, and mattock with 25.8 percent. The bar techniques showed an average of about 15 percent. For details see individual summary tabulation in table No. 2.

Plot No. 82: This plot was checked on October 19, 1939. It was situated on a steep, brushy, easterly slope and seemed to suffer mostly from drought. It was interesting to note that plants did better under the shade of brushy spots. As seems to be the usual case on steep slopes some burying by soil movement was observed. Sheep had not bothered this plot to any extent.

Wind River stock was the best with an average of 41.1 percent survival. All of the others averaged less than 24 percent.

Deep shovel planting was best with 40 percent survival, followed by shallow shovel at 34.4 percent. The Mattock and Council D Handle were 24 percent and 27.2 percent respectively, while the slit shovel and two bar techniques were below 20 percent in survival.

The average survival of the plot was 24.4 percent.

Plot No. 83:: This plot was checked on October 19, 1939. It was situated on a relatively flat south slope. The plot had been subjected to quite a bit of sheep trampling this year. There were several well worn paths through the plot, but they had little affect on survival as illustrated by the small damage done to Wind River stock situated near and on paths. As a rule drought seemed to show evidence of being the main cause of death of seedlings.

The survival of the plot averaged 22.1 percent. Wind River stock with an average survival of 41.1 percent was the best stock. All other stock averaged less than 20 percent in survival.

Shallow shovel planting was the best planting with 42.4 percent survival. Deep shovel was next with 28 percent survival. All others averaged less than 20 percent survival.

Plot No. 84: This plot was checked on October 17, 1939. It was situated on a steep easterly slope. Side hill erosion mostly of a mechanical nature, attributable to sheep, resulted in quite a number of fatalities.

Some rows were noticeably lacking in good planting practice, but at any rate drought seemed to have resulted in the extremely high death rate.

Survival for the plot averaged 9.7 percent. Wind River led with an average survival of 15.4 percent. All others had an average survival of less than 10 percent.

Deep shovel planting was best with an average survival of 20 percent. The Mattock was second with an average survival of 14.4 percent. All other methods of planting were less than 10 percent in survival.

Plot No. 85: This plot was examined on October 24, 1939. It was situated on an easterly slope in the Pine Creek drainage.

On the whole this plot suffered extremely from drought. The few plants which were alive were situated around several old stumps with little or no brush near. There was some evidence that cattle had trampled and mechanically eroded soil onto seedlings.

Survival for the plot averaged 4 percent. Wind River was the best with an average of 8 percent survival. Idaho prison with an

average of 1.7 percent and Savenac with an average of 0.6 percent were the only other types surviving to any extent.

Deep shovel planting was best with an average of 6.4 percent survival. All other methods averaged less than 4 percent survival.

For details see individual summary tabulation in table 2.

T. E. MAKI

and C. F. SMITH

(Note: Only 1 set of Table 2 tabulations was prepared - handwritten on typed forms on letter-size tabulation paper. If not with these notes, they should be in the "Compilation" folder.)

Table 1, attached hereto, gives condensed summary of survival.

RS-INT
FP

April 11, 1940
CFS

TABLE 1

TOOL TEST -- PONDEROSA PINE
% Survival -- October 1939

Planting Method	Flat Plots					Northerly Plots					North & Flat Total	North & Flat Average
	80	81	83	Total	Average	82	84	85	Total	Average		
(All Sources)												
Deep Shovel	48.0	35.2	28.0	111.2	37.7	40.0	20.0	6.4	66.4	22.1	177.6	29.6
Shallow Shovel	51.2	31.2	42.4	124.8	41.6	34.4	0.0	2.4	36.8	12.3	161.6	26.9
Slit-Shovel	25.6	20.0	13.6	59.2	19.7	6.4	3.2	0.0	9.6	3.1	68.8	11.5
Mattock	44.8	25.8	18.4	89.0	29.7	24.0	14.4	3.2	41.6	13.9	130.6	21.8
Council D Handle	44.0	14.4	18.4	76.8	25.6	27.2	7.2	1.6	36.0	12.0	112.8	18.8
Council Offset	26.4	13.6	13.6	53.6	17.9	19.2	6.4	0.8	26.4	8.8	80.0	13.3
R-1 Planting Tool	31.2	16.8	7.2	55.2	18.4	6.4	3.2	0.0	9.6	3.1	64.8	10.8
ALL	40.6	22.4	22.1	85.1	28.4	24.4	9.7	4.0	38.1	12.7	123.2	20.5
Source (All Methods)												
Wind River	76.0	50.8	41.1	167.9	56.0	41.1	15.4	8.0	64.5	21.5	232.4	38.7
Idaho Prison	26.8	16.6	13.7	57.1	19.0	16.6	8.0	1.7	26.3	8.8	83.4	13.9
Monument	26.3	18.8	19.4	64.5	21.5	21.1	6.3	0.0	27.4	9.1	91.9	15.3
Savenac	46.8	18.8	18.3	83.9	28.0	23.4	8.6	0.6	32.6	10.9	116.5	19.4
Bannock	17.7	6.3	8.6	32.6	10.9	10.3	0.6	0.0	10.9	3.6	43.5	7.3
ALL	40.6	22.4	22.1	85.1	28.4	24.4	9.7	4.0	38.1	12.7	123.2	20.5